U.S. Department of Energy

Office of River Protection

P.O. Box 450
Richland, Washington 99352

0062603

SEP 07 2004

04-ED-076

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EDMC

Mr. Michael A. Wilson, Program Manager
Nuclear Waste Program
State of Washington
Department of Ecology
3100 Port of Benton Blvd.
Richland, Washington 99352

Dear Mr. Wilson:

NOTICE OF CONSTRUCTION (NOC) FOR THE BULK VITRIFICATION TEST AND DEMONSTRATION FACILITY AND PARTIAL RETRIEVAL OF TANK 241-S-109, REVISION 1

Reference: ORP letter from R. J. Schepens to M. A. Wilson, Ecology, "Approval of New Source Review Notice of Construction Application for the Supplemental Treatment Test and Demonstration Facility," 04-ED-004, dated February 6, 2004.

The State of Washington Department of Ecology (Ecology) staff recommended revision of the Air Permit application for the Bulk Vitrification Demonstration Project submitted by the U.S. Department of Energy, Office of River Protection (ORP), and CH2M HILL Hanford Group, Inc. (CH2M HILL), to include the partial retrieval activities for Tank 241-S-109. The application in the Reference, submitted February 6, 2004, covered only the Bulk Vitrification Demonstration Project Treatment System. Air permitting activities for the partial retrieval of Tank 241-S-109 were to be included in the Categorical Retrieval NOC, combined with all near-term tank retrievals. The Ecology recommendation was made to support timely approval of both air permitting activities for our accelerated demonstration project schedule.

Attached is the "Notice of Construction for the Bulk Vitrification Test and Demonstration Facility and Partial Retrieval of Tank 241-S-109, Rev. 1" (Attachment 1), the "Permit Writers Checklist for Completeness" (Attachment 2), and the "Hanford Site Air Operating Permit, Notification of Off-Permit Change 00-05-006" (Attachment 3). The NOC application was prepared as the emission of criteria pollutant NOx from the Demonstration Bulk Vitrification System is projected to exceed the emission threshold limit of two tons per year. Therefore, ORP and CH2M HILL are required to submit an NOC application for Ecology approval.

If you have any questions, please contact me, or your staff may contact Dennis W. Bowser, Environmental Division, (509) 373-2566.

Sincerely,

Howard B. [illegible]

for Roy J. Schepens
Manager

ED:DWB

Attachments: (3)

cc w/o attachs:
B. G. Erlandson, BNI
E. S. Aromi, CH2M HILL
D. J. Carrell, CH2M HILL (w/attachs)
J. M. Jaraysi, CH2M HILL
C. J. Kemp, CH2M HILL (w/attachs)
F. R. Miera, CH2M HILL
J. Cox, CTUIR
S. Harris, CTUIR
K. A. Conaway, Ecology
S. L. Dahl, Ecology
J. L. Hensley, Ecology (w/attachs 2 copies)
J. J. Lyon, Ecology
O. S. Wang, Ecology (w/attachs)
J. A. Bates, FHI
W. E. Green, FHI (w/attachs)
P. Sobotta, NPT
K. Niles, Oregon Energy
M. F. Jarvis, RL
A. W. Conklin, WDOH
R. Jim, YN
Administrative Record
CH2M Correspondence Control
Environmental Portal, LMSI

Attachment 1
04-ED-076

Notice of Construction for the Bulk Vitrification Test and Demonstration Facility and Partial Retrieval of Tank 241-S-109, Revision 1

NOTICE OF CONSTRUCTION FOR THE BULK VITRIFICATION TEST AND DEMONSTRATION FACILITY AND PARTIAL RETRIEVAL OF TANK 241-S-109, REV. 1

Prepared by
CH2M HILL Hanford Group, Inc.

Date Published
August 2004

United States Department of Energy
Office of River Protection
P.O. Box 450
Richland, Washington

SUMMARY

The U.S. Department of Energy, Office of River Protection and CH2M HILL Hanford Group, Inc. are proposing to conduct a Research, Development, and Demonstration bulk vitrification test program to treat mixed waste retrieved from Single-Shell Tank 241-S-109. The Demonstration Bulk Vitrification System will be located west of the 241-S Tank Farm in the 200 West Area of the Hanford Site. The bulk vitrification testing program will process up to 1,135,500 L (300,000 gal) of tank waste in two test phases. The 1,135,500 L (300,000 gal) is less than 1% of the 53 million gallons of tank waste stored in the Hanford double-shell tanks and single-shell tanks. Phase 1 will consist of processing up to three container loads of actual mixed waste and simulants, each incorporating up to 1135 L (300 gal) of tank waste. Simulants (i.e., materials similar in chemical composition to tank waste) will be added to the waste load along with the glass formers to create a container load (including insulating materials) up to 54.4 m^3 (1920 ft^3). Phase 2 will consist of processing of up to 50 (including the containers from Phase 1) container loads of mixed tank waste. In Phase 2, tank waste, process additives, and process control parameters will be varied to establish optimum operating process parameters or envelopes. Research, Development, and Demonstration programs are authorized under the *Resource Conservation and Recovery Act of 1976,* U.S. Environmental Protection Agency Regulation 40 *Code of Federal Regulations* 270.65, and *Washington Administrative Code* 173-303-809.

This document evaluates the potential toxic emissions from Single-Shell Tank 241-S-109 retrieval activities and Demonstration Bulk Vitrification System waste processing activities utilizing the toxic air pollutant inventory as identified in the Tank Waste Information Network System. Results of the evaluation find that toxic air emissions from retrieval and processing of the waste stream from Single-Shell Tank 241-S-109 would be below *Washington Administrative Code* regulations for Small Quantity Emission Rates and Acceptable Source Impact Levels would not be exceeded. Dispersion calculations of annual concentration of toxic air pollutants indicate that concentrations of these compounds at the Hanford Site boundary are within regulatory threshold levels.

In addition, this document evaluates the estimated emissions of particulate matter resulting from operations of the Demonstration Bulk Vitrification System. Estimated emissions are below registration and reporting threshold levels of WAC 173-400-102.

The retrieval activity at Single-Shell Tank 241-S-109 results in emissions of ammonia that is calculated to be below threshold levels. Offgases from the waste retrieval activities are vented to an existing onsite portable exhauster.

The Demonstration Bulk Vitrification System waste processing activity results in emissions of oxides of nitrogen (NOx) as being the criteria pollutant of concern. Emissions of ammonia will occur but are calculated to be below threshold levels. The Demonstration Bulk Vitrification System requires high heat input to vitrify the waste mixture. High voltage electrical power will be applied to electrodes, vitrifying the waste mixture via resistive heating to produce an immobilized low-activity waste. Offgases from the Demonstration Bulk Vitrification System are vented to an Offgas Treatment System.

In addition to NOx emissions from the Demonstration Bulk Vitrification System processing, a backup diesel generator rated at 1200 KW (1600-hp) will contribute to NOx emissions. The purpose of the generator is to provide backup electrical power to the Demonstration Bulk Vitrification System Offgas Treatment System if primary power is lost. However, diesel generator operation is anticipated primarily for testing purposes and routine maintenance. An onsite diesel-fired boiler rated at 3.4 MM BTU/hr may be used for steam production to the mixer dryer. The onsite diesel-fired boiler would also contribute to NOx emissions.

Electrical power for the portable exhauster during waste retrieval activities will be obtained from Hanford's existing electrical grid system. There are no NOx emissions from operation of the portable exhauster. Calculated NOx emissions are expected to exceed the threshold exemption quantity of two tons/year. In accordance with WAC 173-400-100(2), this Notice of Construction application is being submitted for the retrieval of waste from Single-Shell Tank 241-S-109, installation and operation of the Demonstration Bulk Vitrification System, installation and operation of a backup diesel generator, and installation and operation of an onsite diesel-fired boiler. Calculated NOx emissions from the vitrification process, the backup diesel generator, and the diesel-fired boiler is approximately 13 tons of NOx per year.

NOx from the Demonstration Bulk Vitrification System process will be controlled using selective catalytic reduction. This control technology is the most developed and widely used post-process NOx control technology. The Demonstration Bulk Vitrification System use of selective catalytic reduction is considered the best available control technology for NOx in accordance with WAC 173-400.

CONTENTS

APPENDICES

FIGURES

TABLE

TERMS

ASIL	acceptable source impact level
CAS	Chemical Abstract Services
CEMS	Continuous Emissions Monitoring System
CFR	*Code of Federal Regulations*
cm^3	cubic centimeters
CO	carbon monoxide
cfm	cubic feet per minute
DBVS	Demonstration Bulk Vitrification System
DOE	U.S. Department of Energy
ft	feet
g	gram
gpm	gallon per minute
HEPA	high-efficiency particulate air (filter)
HFFACO	*Hanford Federal Facility Agreement and Consent Order*
hp	horsepower
hrs	hours
ICV®	in-container vitrification (licensed process)
IDF	Integrated Disposal Facility
ILAW	immobilized low-activity waste
KW	kilowatt
L	liter
LAW	low-activity waste
lbs	pounds
m	meters
m^3	cubic meter
mg	milligram
µg	micrograms
Na	Sodium
NOC	notice of construction
NOx	oxides of nitrogen
OGTS	offgas treatment system
ORP	Office of River Protection
PM	particulate matter
PM_{10}	particulate matter under 10 microns
ppm	parts per million
RD&D	Research, Development, and Demonstration
SCR	selective catalytic reduction
sec	second
SOx	oxides of sulfur
SQER	small quantity emission rate
SST	single-shell tank
TAP	toxic air pollutant
TWINS	Tank Waste Information Network System
VOC	volatile organic compound
WAC	*Washington Administrative Code*
WTP	Waste Treatment Plant
yr	year

METRIC CONVERSION CHART

Into metric units / **Out of metric units**

If you know	Multiply by	To get	If you know	Multiply by	To get
Length			**Length**		
inches	25.40	millimeters	millimeters	0.03937	inches
inches	2.54	centimeters	centimeters	0.393701	inches
feet	0.3048	meters	meters	3.28084	feet
yards	0.9144	meters	meters	1.0936	yards
miles (statute)	1.60934	kilometers	kilometers	0.62137	miles (statute)
Area			**Area**		
square inches	6.4516	square centimeters	square centimeters	0.155	square inches
square feet	0.09290304	square meters	square meters	10.7639	square feet
square yards	0.8361274	square meters	square meters	1.19599	square yards
square miles	2.59	square kilometers	square kilometers	0.386102	square miles
acres	0.404687	hectares	hectares	2.47104	acres
Mass (weight)			**Mass (weight)**		
ounces (avoir)	28.34952	grams	grams	0.035274	ounces (avoir)
pounds	0.45359237	kilograms	kilograms	2.204623	pounds (avoir)
tons (short)	0.9071847	tons (metric)	tons (metric)	1.1023	tons (short)
Volume			**Volume**		
ounces (U.S., liquid)	29.57353	milliliters	milliliters	0.033814	ounces (U.S., liquid)
quarts (U.S., liquid)	0.9463529	liters	liters	1.0567	quarts (U.S., liquid)
gallons (U.S., liquid)	3.7854	liters	liters	0.26417	gallons (U.S., liquid)
cubic feet	0.02831685	cubic meters	cubic meters	35.3147	cubic feet
cubic yards	0.7645549	cubic meters	cubic meters	1.308	cubic yards
Temperature			**Temperature**		
Fahrenheit	subtract 32 then multiply by 5/9ths	Celsius	Celsius	multiply by 9/5ths, then add 32	Fahrenheit
Energy			**Energy**		
kilowatt hour	3,412	British thermal unit	British thermal unit	0.000293	kilowatt hour
kilowatt	0.94782	British thermal unit per second	British thermal unit per second	1.055	kilowatt
Force/Pressure			**Force/Pressure**		
pounds (force) per square inch	6.894757	kilopascals	kilopascals	0.14504	pounds per square inch

Source: *Engineering Unit Conversions*, M. R. Lindeburg, PE., Second Ed., 1990, Professional Publications, Inc., Belmont, California.

1.0 INTRODUCTION

This document serves as the Notice of Construction (NOC) for the retrieval of mixed waste from Single-Shell Tank (SST) 241-S-109 and the Research, Development, and Demonstration (RD&D) test program to treat the mixed waste. SST 241-S-109 is located in the 241- S Tank Farm in the 200 West Area of the Hanford Site. The Demonstration Bulk Vitrification System (DBVS) will be located west of the 241-S Tank Farm in close proximity to SST 241-S-109. The RD&D program will evaluate the performance of the bulk vitrification of low-activity waste (LAW) in waste containers as a supplemental treatment technology supporting the Hanford Waste Treatment Plant (WTP) now under construction. The DBVS will be designed, constructed, and operated in two phases and will be a RD&D permitted activity under *Washington Administrative Code* (WAC) 173-303-809 and 40 *Code of Federal Regulations* (CFR) 270.65. This permit is for 400 operating days of actual waste processing. This NOC is submitted in accordance with WAC 173-400. Table 1 provides details on the location of SST 241-S-109 and the approximate coordinates of areas where waste retrieval and waste processing equipment will be located that are the subject of this notification.

Table 1. Emission Unit Covered by the Notice of Construction

Unit	Location	Geodetic Coordinates	
		North Latitude	West Longitude
SST 241-S-109 • Portable Exhauster	241-S Tank Farm	46°32'22"	119°37'46"
Demonstration Bulk Vitrification System Process • Baghouse exhauster • DBVS exhauster • Backup diesel generator • Diesel-fired boiler	West of the 241-S Tank Farm and West of Cooper Avenue, 200 West Area	46°32'23"	119°37'54"

The proposed action will retrieve a liquid salt solution waste stream from SST 241-S-109. The DBVS will be designed to receive a 5 molar sodium (Na) solution waste feed at a rate of approximately 76 L/min (20 gal/min). The waste will be mixed with glass formers (e.g., soil) and dried prior to processing (or treating) the retrieved waste by an in-container vitrification (ICV®) process. The vitrification of the waste will occur in the same waste container used for disposal. After vitrification, the waste container will be moved to an onsite storage area or disposal site. The scope of this NOC begins at SST 241-S-109 waste retrieval and finishes with storage or disposal of the packaged waste container.

The incoming DBVS waste stream will be mixed with glass forming additives (e.g., soil and minerals) and dried before being placed in a waste container for vitrification by electrode resistive heating. Filled waste containers will be transferred to a temporary storage area at the

DBVS site for the duration of the RD&D demonstration. The stored containers will ultimately be transferred to and disposed of in the future Integrated Disposal Facility (IDF) or another permitted onsite facility in the 200 Area of the Hanford Site.

2.0 SCOPE

The scope of this document is to analyze the toxic air pollutant (TAP) data for SST 241-S-109 as reported in the Tank Waste Information Network System (TWINS) and to calculate, using the maximum reported TAP concentration value, an offsite concentration based on a stack discharge flow rate for retrieval activities and for DBVS processing. The calculated results are then compared to WAC 173-400 and 173-460 regulations for Small Quantity Emission Rate (SQER) and Acceptable Source Impact Level (ASIL) thresholds, respectively. Calculated TAP emissions have been prepared (Appendix B) for mixed waste retrieval activities from SST 241-S-109 and for DBVS processing.

Also analyzed is the emission of criteria pollutants from the DBVS process created by electrode resistive heating, the expected emissions from the 1200 kilowatt (KW) (1600 horsepower [hp]) diesel generator, and a diesel-fired boiler. The criteria pollutant of concern is primarily NOx. Emissions of particulate matter (PM) and particulate matter under10 microns (PM_{10}) from off-loading soil storage piles, mixer/dryer operations, waste container filling, and melter operations are also calculated in addition to volatile organic compound (VOC) emissions.

3.0 BACKGROUND INFORMATION

The U.S. Department of Energy (DOE), Office of River Protection (ORP) and CH2M HILL Hanford Group, Inc. have created aggressive initiatives to accelerate the closure of tank farms with SSTs containing mixed radioactive and dangerous waste at the Hanford Site. To meet the *Hanford Federal Facilities Agreement and Consent Order* (HFFACO) (Ecology et al. 1989) requirement for completing SST retrieval by 2018 and tank waste treatment by 2028 (Milestones 45-00 and 62-00), ORP is evaluating the bulk vitrification technology to support the WTP throughput to meet HFFACO milestones. An RD&D project using bulk vitrification to immobilize LAW from SST 241-S-109 is planned to provide data for waste form qualification and performance assessment in response to Milestones M-62-08 and M-62-11.

The RD&D project will evaluate the DBVS process as a suitable immobilization process. The DBVS will be used to evaluate the ability to produce immobilized low-activity waste (ILAW) that is equivalent to WTP ILAW; the compatibility of the technology with actual tank waste; the safety, efficiency, and potential cost-effectiveness; and the feasibility for scale-up to full-scale application.

4.0 LOCATION

SST 241-S-109 and the DBVS are located on the DOE Hanford Site, in the 200 West Area, Richland, Washington (Figure 1). SST 241-S-109 is located in the 241-S Tank Farm and the DBVS will be located west of the 241-S Tank Farm and west of Cooper Avenue (Figure 2). The DBVS is operated and managed by CH2M HILL Hanford Group, Inc. for ORP under contract DE-AC06-99RL-14047.

5.0 WASTE PROCESSING SYSTEM

5.1 SYSTEM LAYOUT

Figure 3 shows the DBVS system layout west of the 241-S Tank Farm. The waste receiving tanks, processing units, and ancillary equipment will either be skid- or trailer-mounted, or will be placed on concrete pads. All waste tanks will have secondary containment and will be monitored for leaks. Waste piping runs between skids or trailers will be compliant with the *Resource Conservation and Recovery Act of 1976* (RCRA) requirements. Commercial unit support systems include compressed air, instrument air, deionized water, and steam supply. Electrical services will be provided by Hanford Site utilities. Office and field trailers will be set up to accommodate the office and field staffs. Staging areas will be constructed for incoming empty waste containers, and a storage pad will be constructed for the vitrified waste containers.

The following sections contain additional information on the waste retrieval and DBVS processing activities to be conducted under this NOC application.

5.2 WASTE RETRIEVAL FROM SST 241-S-109

SST 241-S-109 is a 23 meter (75 ft) diameter tank with a capacity of 2,870,000 L (758,000 gal). Currently there is 2,017,000 L (533,000 gal) of saltcake, including 60,600 L (16,000 gal) of interstitial salt cake liquid, and 60,500 L (13,000 gal) of sludge. The waste in SST 241-S-109 is stratified. In the bottom of the tank is a layer of sludge. On top of the sludge is a mixed saltcake solid and liquid layer and the top layer is drained saltcake. The saltcake is the source of waste material for DBVS processing. The sludge layer will not be removed under this DBVS project. The balance of sludge waste of approximately 60,500 L (13,000 gal) will be retrieved in accordance with the HFFACO and is included in a separate NOC application "Notice of Construction Application For Operations of Waste Retrieval Systems In Single-Shell Tank Farms."

Partial retrieval of mixed waste from SST 241-S-109 will occur in two phases to support DBVS processing. Phase 1 testing will utilize only minimal amounts of actual tank waste and be conducted over a one-to-three month timeframe. Phase 1 involves salt cake dissolution and results in approximately 1135 L (300 gal) of tank waste (dissolved in approximately 3,780 L [1,000 gal] of brine) transferred to the DBVS. A pump will be installed in the center of the tank to retrieve the liquid waste with the pump suction above the sludge layer (approximately 1 foot off the bottom). Existing saltwell brine will be mobilized and removed followed by the dissolution of salt cake waste through the controlled addition of water through the pump dilution system. Retrieved waste will be routed to a 3,780 L (1,000 gal) staging tank before transfer to the DBVS. Figure 4 shows the Phase 1 waste retrieval system process flow diagram.

In Phase 2, up to 1,355,500 L (300,000 gal) will be retrieved using a pump and low volume sluice nozzles. Up to three remote water distribution devices will be installed to spray water onto the tank waste. As the water penetrates the salt cake, the waste will be dissolved and mobilized toward the center of the tank where it will be pumped out.

During Phase 1, the waste will be transferred from SST 241-S-109 waste retrieval operations using RCRA compliant over-ground piping to a 3,780 L (1,000 gal) waste staging tank. The waste stream will be sampled and characterized for DBVS acceptance. The waste composition

received by the DBVS is, in general, referred to as a salt solution. Waste not meeting the DBVS acceptance criteria will be routed to the double-shell tank system. During Phase 2 waste retrieval operations, the waste will be transferred directly to the DBVS waste receipt tanks and bypass the waste staging tank. Figure 5 shows the Phase 2 waste retrieval system process flow diagram.

5.2.1 Waste Retrieval Ventilation System

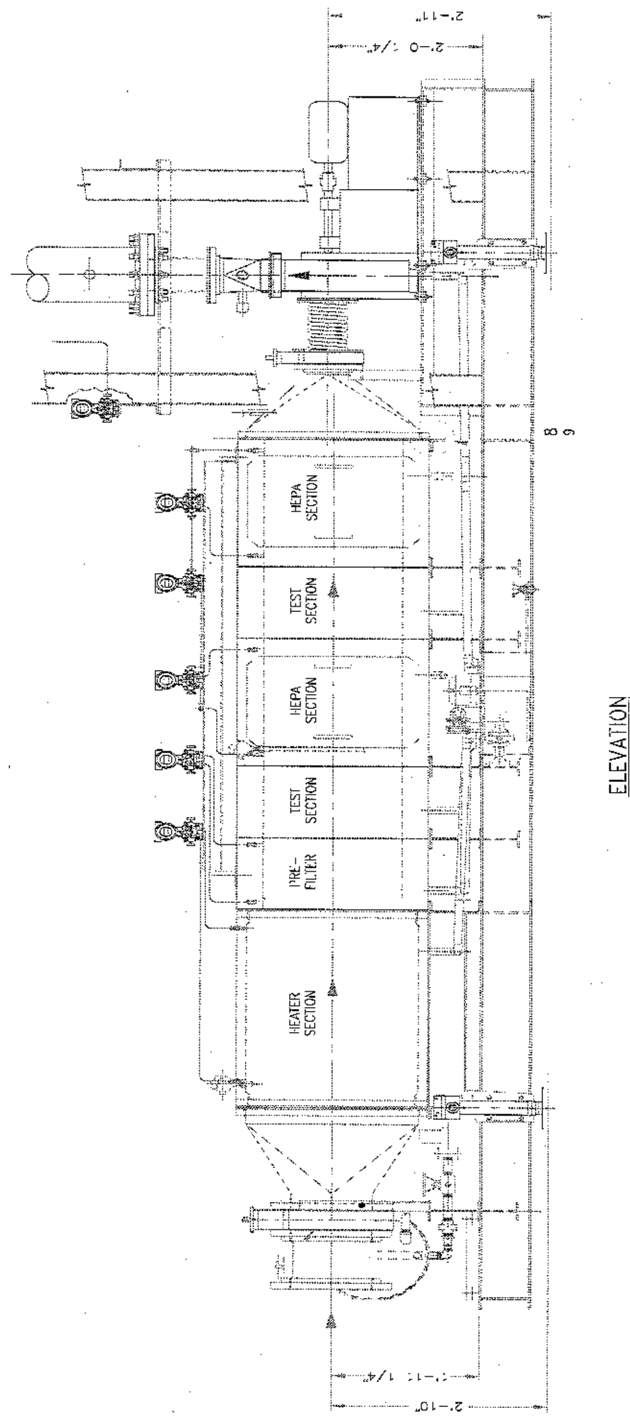
An existing, onsite portable exhauster (Figure 6) will be used to ventilate SST 241-S-109 during waste retrieval activities. The portable exhauster will be skid-mounted with high-efficiency particulate air (HEPA) filtration and connected to a tank riser. The portable exhauster will exhaust up to 0.47 m^3/sec (1,000 cfm). The portable exhauster will be similar to the exhauster used for waste retrieval demonstration activities conducted at Tanks 241-S-102, 241-S-112, and 241-C-106. If a new or different exhauster is used for retrieval from SST 241-S-109, the exhauster design will be provided to Ecology prior to initiating waste retrieval.

During exhauster operations, air from SST 241-S-109 will pass through a demister, heater, a pre-filter, and two banks of HEPA filters (in series) before an exhauster discharges the airstream through a stack to the atmosphere. There will be capability at the stack to measure airflow and extract air samples.

The portable exhauster major components include the following:

- Demister
- Glycol (or similar) heaters and associated components
- One pre-filter and housing
- Two HEPA filters and test sections
- One exhaust fan
- Stack containing a sampling system.

Figure 6. Typical Onsite Portable Exhauster



The exhaust fan will be constructed of non-sparking materials and will meet Air Movement Contractors Association (AMCA) Standard 99-0401-86 and be Type A construction. The fan will be a centrifugal type and be statically and dynamically balanced as an assembly.

During Phase 1, the 3,780 L (1,000 gal) waste staging tank will be equipped with a HEPA filtered breather vent.

5.2.2 Waste Retrieval Emissions Monitoring

Instruments used to detect fugitive organic emissions are part of Hanford's Industrial Hygiene worker monitoring program and will be used to monitor VOCs a minimum of three times during waste retrieval operations from SST 241-S-109: once before exhauster operation begins, once during exhauster operation, and once after exhauster operation is completed. Records of VOC sample results will be maintained onsite and made available to Ecology as requested.

5.3 BULK VITRIFICATION SYSTEM PROCESS

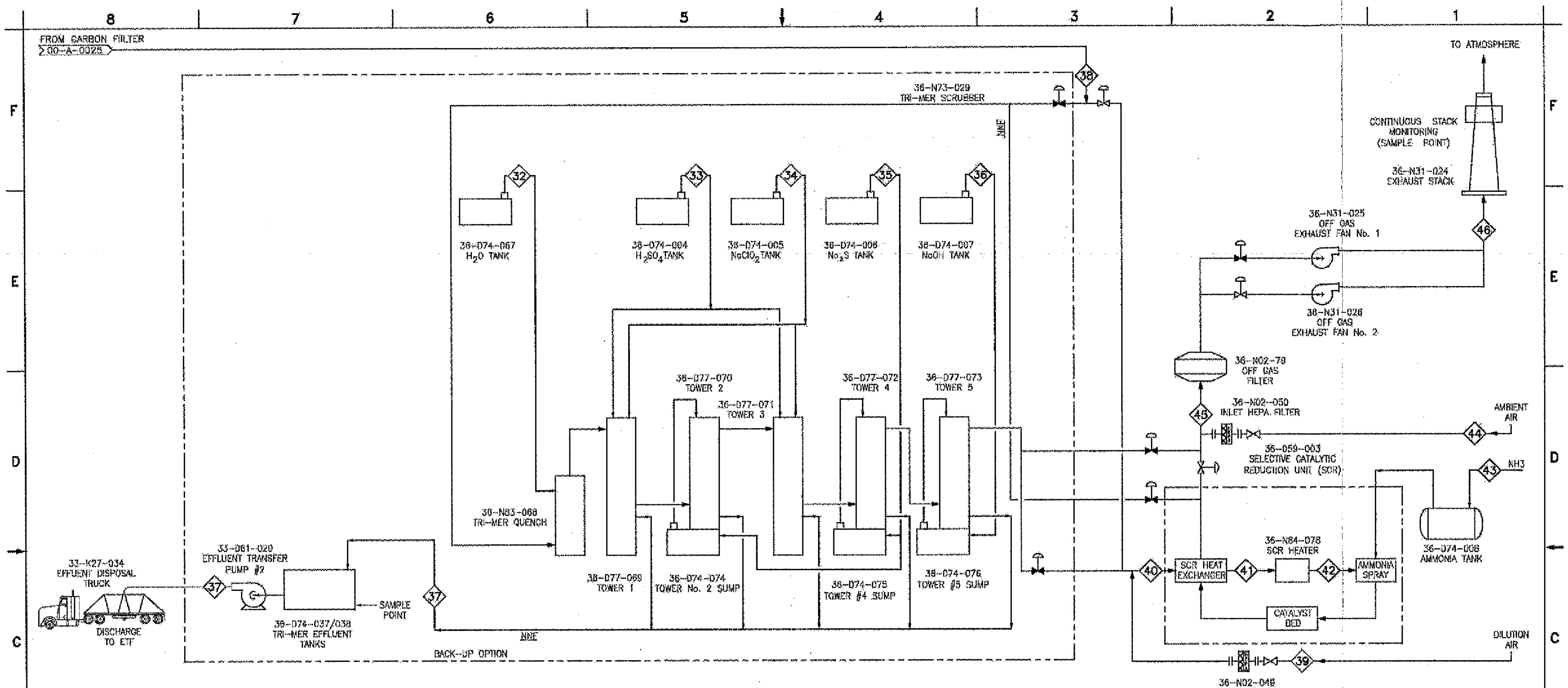
The DBVS will utilize a process of ICV® as shown in the process flow diagram (Figure 7). The liquid salt solution received at the DBVS will be mixed with glass formers and excess water will be removed from the mixture as it goes through the mixer dryer. The mixture will be vacuum transferred and distributed into a refractory-lined sealed waste container, where electrodes penetrating the waste mixture will vitrify the waste via resistive heating.

The waste and waste container will undergo cooling, sampling, and external decontamination as required. Soil and sand will be added to sufficiently fill the void container volume. The waste container (and vitrified waste contents) will be temporarily stored onsite awaiting disposal at the IDF or an alternate approved onsite mixed low-level burial ground or storage area.

The DBVS RD&D program will be operated in two phases. The Phase 1 will consist of processing up to three container loads, each incorporating up to 1135 L (300 gal) of tank waste. Simulants (i.e., materials similar in chemical composition to tank waste) will be added to the waste load along with the glass formers to create a container load (including insulation materials) of up to 54.4 m^3 (1920 ft^3). Phase 1 testing is designed to provide waste form performance data for the bulk vitrification technology.

The goal of Phase 2 is to optimize the DBVS performance and operation for potential future full-scale use. Phase 2 will consist of processing up to 50 container loads (including the containers vitrified in Phase 1) of mixed waste totaling up to 1,355,500 L (300,000 gal) of tank waste. Tank waste, process additives, and process control parameters will be varied to establish optimum operating process parameters or envelopes. It is anticipated that one container load of material will be vitrified weekly for the duration of the project.

Figure 7. Bulk Vitrification Flow Diagram (page 3 of 3)



		ALTERNATE – NORMALLY NO FLOW															
STREAM No.		32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
STREAM NAME	UNITS	TRI-MER QUENCH	DILUTE SULFURIC ACID	DILUTE NaClO2	DILUTE Na2S	DILUTE NaOH	RETURN SOLUTION	C-FILTER DISCHARGE	DILUTION AIR	SCR FEED	PART HEATED SCR FEED	HEATED SCR FEED	AMMONIA FEED	SCR AMBIENT AIR	STACK DISCHARGE	STACK DISCHARGE
FLOW TYPE,(Batch or Continuous,Transfer units)		Cont.	Cont.	Cont.	Cont.	Cont.	Cont.	Cont.	Cont.	Cont.	Cont.	Cont.	Cont.	Cont.	Cont.	Cont.
PHASE		LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	GAS	GAS	GAS	GAS	GAS	GAS	GAS	GAS	GAS
DESIGN MASS FLOWS	kg	0	54,818	68,873	31,520	21,982	208,126	1,126,123	443,589	1,569,712	1,569,712	1,569,712	1,871	0	1,571,830	1,571,830
CONTINUOUS VOLUMETRIC FLOWS (LIQ/GAS)	USG/CF	0	13,705	25,216	7,675	4,934	61,529	40,012,540	13,265,987	53,273,274	62,676,820	91,256,780	94,762	0	81,199,485	81,199,485
BATCH TRANSFER RATE	as shown															
CYCLE TIME	hr															
SpG		0.997	1.04	1.07	1.09	1.1	1.07	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
GAS PRESSURE	in. WC	n/a	n/a	n/a	n/a	n/a	n/a	-4	0	-4	-10	-12	n/a	0	-24	2
TEMPERATURE	°C	25	25	25	25	25	25	75	25	82	120	300	25	25	238	236
H2O Liquid	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H2O Gas	kg	0	0	0	0	0	0	29,054	--	29,040	29,040	29,040	0	0	32,066	32,066
Na	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SO2 GAS	ppm	0	0	0	0	0	0	1.47	0	1.06	1.06	1.06	0	0	1.05	1.05
NOx GAS	ppm	0	0	0	0	0	0	4,257	0	3,068	3,068	3,068	0	0	82	82
HCl GAS	ppm	0	0	0	0	0	0	0.14	0	0.1	0.1	0.1	0	0	0.1	0.1
137Cs	Ci	0	0	0	0	0	0	9.3E-08	0	9.3E-08	9.3E-08	9.3E-08	0	0	9.3E-08	9.3E-08
99Tc	Ci	0	0	0	0	0	0	3.7E-09	0	3.7E-09	3.7E-09	3.7E-09	0	0	3.7E-09	3.7E-09
TRU	Ci	0	0	0	0	0	0	5.4E-13	0	5.4E-13	5.4E-13	5.4E-13	0	0	5.4E-13	5.4E-13
129I	Ci	0	0	0	0	0	0	1.1E-10	0	1.1E-10	1.1E-10	1.1E-10	0	0	1.1E-10	1.1E-10

NOTES:

1. NOx EMISSION AT STREAM 46 WILL BE LESS THAN 1.5lbs/hr.
2. VALVES ARE SHOWN TO INDICATE PROCESS INTENT
3. NNF – NORMALLY NO FLOW

F-143643-00-A-0026 A
U.S. DEPARTMENT OF ENERGY
amec
FULL DBVS
TRI-MER AND SCR
SINGLE BLOCK DIAGRAM

5.3.1 System Capacity

The DBVS is designed to receive the incoming 5 molar Na solution tank waste feed at a rate of 76 L/min (20 gal/min) but the DBVS design processing rate is 4.1 L per minute (1.09 gpm) of 5 molar Na solution. However, the feed rate may be varied as one of the parameters being evaluated through this demonstration project. Under Phase 2, individual campaigns may be conducted using up to 76,540 L (20,220 gal) of 5 molar Na solution in a container load

5.3.2 Waste Receipt

In Phase 1, the DBVS receives mixed waste from SST 241-S-109 via an intermediary 3,780 L (1,000 gal) waste staging tank and then into waste receipt tanks for processing. The tank capacities for the DBVS waste receipt are 68,140 L (18,000 gal). In Phase 2, up to four 68,140 L (18,000 gal) tanks will be used for waste receipt and storage of mixed waste from SST 241-S-109. Up to 50 containers (including containers vitrified in Phase 1) will be produced in Phase 2. Multiple waste receipt tanks will allow one or more tanks to be used for waste feed to the DBVS while the other tanks are being filled and sampled.

Each waste receipt tank is sized to accommodate the incoming waste stream. All waste receipt tanks will be double-shell construction with double-contained waste transfer lines and will have leak detection capability. Waste tanks will be vented through the offgas treatment system (OGTS) (Section 5.3.8).

5.3.3 Process Additives

The DBVS will receive soil, glass additives, and other materials necessary to the process or as processing aids. Soil will be used to form the matrix for the vitrification process and to add an additional layer of clean material on the vitrified mass in the container. Vitrification aids such as graphite, boron, and zirconium, may be used. Graphite will be placed in the DBVS container to help initiate the soil/waste melting process. Boron and zirconium will be used in small quantities to increase glass performance (waste retention). A castable refractory, sand, and refractory insulating board will be used as insulators on the inside of the container.

There will be a period of DBVS system testing using a waste simulant consisting of a nonhazardous salt cake or slurry. This waste simulant will be used for running system checkout and vitrification tests prior to processing of actual waste and used as a filler material during Phase 1 and a spiking material in Phase 2. Because the majority of simulant will be used in Phase 1, a 68,140 L (18,000 gal) double-shell tank will be used for simulant storage during system testing. This tank may be used as a waste receipt tank during Phase 2.

5.3.4 Waste Feed Preparation

Waste feed material will enter the waste receipt tanks at the DBVS site. Prior to starting the vitrification process, the waste feed material will be mixed with soil and additives and dried to approximately two percent (2%) moisture content. The mixer/dryer will be heated by steam from an onsite boiler. Appropriate additives will be conveyed or transferred to the unit. The dry material transfer systems will be equipped with weigh stations to control the amount of material being added to the mixer/dryer. Emissions from the mixer/dryer will be routed to the OGTS.

The mixer/dryer's design capacity is 10,000 L (2,640 gal) but will operate at a nominal fill fraction of 45% to 50%. The nominal cycle time is between six and eight hours. During the mixing/drying cycle, the unit will be operated under vacuum to promote the release of moisture from the material being processed until required dryness is achieved.

5.3.5 Vitrification Container Preparation

The typical waste container for the vitrification process is expected to be a steel box approximately 3.0 m high (10 ft), 2.4 m wide (8 ft), and 7.3 m long (24 ft). Containers will comply with the waste acceptance criteria for the disposal facility. Prior to waste distribution, the box will be lined with insulating board, sand, and a layer of castable refractory. The castable refractory will face the waste material. A layer of melt-initiating graphite and soil will be placed over the castable refractory in the bottom of the container.

A steel lid with attached electrodes will be sealed onto the box prior to waste deposition using bolted flanges and a refractory gasket. The lid contains several ports for waste material addition, electrode connections, venting, sampling, and introduction of post-vitrification materials. All connections will be mechanically sealed to the box lid. In addition, waste transfer connections will be equipped with shutoff valves to prevent spillage of material as the chute is attached to and removed from the port. To minimize the potential for contamination to workers and the environment, each connection point will be equipped with secondary containment and spilled material recovery provisions during material transfer, melting, and cooldown. The container will contain ports to obtain samples of the vitrified waste for analyses. The waste container filling/vitrification station will be equipped with radiation shielding, as required. The container-filling operation is performed under negative pressure and exhausted out the vent port to the OGTS.

5.3.6 In-Container Vitrification

The waste mixture from the mixer/dryer will be placed into the vitrification container through ports in the sealed box lid. Simulants and glass formers will be added to fill the container. Electric power will be applied to the electrodes, vitrifying the container contents via resistive heating. Ambient air, filtered through a HEPA filter, is injected to cool the vitrification offgases and provide thermal protection for sintered metal filters. Vitrification offgases are vented under negative pressure to the OGTS. During the vitrification process, the depth of material will typically decrease due to consolidation in melting.

Both "bottom-up" and "top-down" melting may be conducted during testing. Top-down melting is conducted by applying power to the electrodes only after all waste materials and process additives have been placed in the container. Bottom-up melting begins melting with a shallow layer of material in the container and continues as more material is added until the desired depth of melt is obtained.

5.3.7 Post-Vitrification Container Handling

After vitrification has been completed, the container connection to the OGTS will be maintained. Clean fill materials will be added to fill cavities around the electrodes and cover the top of the vitrified mass to minimize headspace in the container.

Sampling of the vitrified waste, radiation surveying, and external decontamination, as necessary, can be conducted anytime after initial cooling has been completed. Sampling of the melt will be conducted, as required, by a coring process through a port in the side of the container

Temporary storage for up to 50 treated waste containers will be located at the DBVS site. At the completion of DBVS activities, waste containers will be transported to the IDF or to another permitted storage or disposal facility.

5.3.8 DBVS Offgas Treatment System

Emissions may consist of either fugitive (i.e., bulk process additive loading and transfer) or point (i.e., stack) sources. Hazardous or radioactive emissions will not be released through fugitive sources, as those sources will be limited to nonhazardous and nonradioactive materials.

Point sources may emit both nonradioactive and radioactive emissions. A continuous emissions monitoring system (CEMS) will monitor emissions of radionuclides, and criteria pollutants (particulate matter, carbon monoxide (CO), oxides of nitrogen (NOx), and oxides of sulfur (SOx). The CEMS will be designed, installed, and operated in compliance with applicable portions of 40 CFR 60, Appendix B. For radioactive emissions, the design of the gaseous and particulate effluent monitoring system will comply with ANSI/HPS N13.1, *Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities.*

Offgas treatment for DBVS operations will include the following:

- Particulate and gaseous emissions from waste receipt and storage
- Particulate emissions from process additive receipt, storage, and transfer (not including fugitive emissions from stockpiles)
- Particulate and gaseous emissions from mixer/dryer
- Particulate and gaseous emissions from waste container filling and vitrification
- Particulate emissions from waste container topoff after vitrification.

All offgas system connections to treatment equipment and the waste container tops will be sealed and the offgas ducting maintained under negative pressure. With the exception of process additive management emissions, all system emissions will be routed to an OGTS prior to discharge to the atmosphere.

The major components of the DBVS OGTS are as follows:

- Sintered metal filters
- Glycol cooled condenser (mixer/dryer offgases and scrubber exhaust gases)
- Mist eliminators
- Wet gas scrubbers
- Heater
- HEPA filters (2 HEPA filters in series)

- Carbon filter
- Polishing filter
- Packed tower scrubber (optional)
- Selective Catalytic Reduction (SCR) Unit(s)
- Exhaust fan and stack.

5.3.8.1 Process Additive Emissions Control. Particulate emissions from offloading and transfer of process additives will be controlled by dedicated baghouse and vent systems. A covered hopper with a sealed pneumatic conveying system will be used to transfer soil to the mixer/dryer soil holding tank or silos. Particulate matter collected at the baghouse system is returned to the appropriate additive storage area for reuse.

5.3.8.2 Mixer/Dryer Offgas Emissions Control. The mixer/dryer emissions will be partially treated for moisture removal prior to being routed to the OGTS downstream of the venturi scrubber. Water condensed in the condenser and removed in the mist eliminator will be routed to a storage tank for sampling and subsequent treatment or disposal.

5.3.8.3 Phase 1 Main Offgas Treatment System. The Phase 1 OGTS will consist of two sintered metal filters in series, a quencher, venturi scrubber, and mist eliminator system. Dilute sodium hydroxide will be injected in both the quencher and venturi scrubber to reduce hydrogen chloride and other acid gas emissions. Scrubber system offgases will pass through an additional condenser and mist eliminator, with drainage from those units routed to the scrubber recycle tanks. An offgas heater, two banks of HEPA filters (in series), and a carbon filter will follow the mist eliminator. A polishing filter will be installed downstream of the carbon filter.

NOx treatment will be accomplished by use of a SCR unit. More than one SCR unit may be used. A packed tower scrubber may be used to allow the option of routing exhaust gases either through the SCR unit(s) or the tower scrubber to determine the effect on both scrubbing efficiency and scrubber blowdown rates. From the SCR unit(s), offgases will be discharged through the exhaust stack equipped with sample ports and monitoring equipment. Dust collected from the sintered metal filters will be recycled to the mixer/dryer, except for the final dust batch, which will be vitrified and sent to the IDF or another permitted disposal facility. Blowdown from the scrubber recycle tank will be sampled and routed to the permitted Effluent Treatment Facility or other permitted facility. Carbon filters will be modular and, upon reaching saturation, will be removed, sampled, and disposed.

5.3.8.4 Phase 2 Main Offgas Treatment System. Performance of the OGTS will be enhanced for Phase 2 to allow higher waste processing rates and to examine other NOx treatment methods. A larger SCR unit may be used or an additional unit added in series based on the analysis of Phase 1 emissions data. A packed tower scrubber may be used to allow the option of routing exhaust gases either through the SCR unit(s) or the tower scrubbers to determine the effect on both scrubbing efficiency and scrubber blowdown rates.

5.3.9 Immobilized Low-Activity Waste Storage

Packages of ILAW produced by the DBVS will be stored at the DBVS until they are transferred to the IDF or another permitted onsite storage/disposal facility. The DBVS is an activity permitted under the *Resource Conservation and Recovery Act of 1976.*

6.0 METHODOLOGY OF COMPARISON CALCULATED EMISSIONS TO SQER AND ASIL THRESHOLDS

For calculation of dispersed offsite concentration of TAPs to members of the public, TAP vapor sample data from SST 241-S-109, as reported in TWINS, was used for developing the pollutant source term. The maximum reported concentration was selected for the TAP Chemical Abstract Services (CAS) number for SST 241-S-109 (Appendix A, Table A-1). A worst-case bounding tank pollutant source inventory was developed that contained the highest concentration of each constituent detected. Emission quantities were calculated based on the worst-case tank scenario using maximum values and represents a conservative approach. Estimated TAP emissions were reviewed against WAC 173-460-160 TAP SQERs and ASILs as shown in Appendix B.

Assumptions made in calculating emission quantities include:

- A maximum concentration of the identified TAP from TWINS was selected for a worst-case pollutant inventory. For SST 241-S-109, the identified Class B TAP is ammonia, CAS # 7664-41-17 at 47.9 ppmv.

  Basis: Selecting the maximum value from TWINS vapor space data would provide a worst-case tank scenario. Emission calculations would, therefore, be based on a worst-case concentration and would provide a bounding calculation of emissions to the environment.

- The DBVS exhauster flow rate is 283 m^3/min (10,000 cfm).

  Basis: The exhauster has a designed flowrate of 283 m^3/min (10,000 cfm). Calculated emissions are based on this flowrate and results are considered conservative because it is unlikely that the exhauster will run continuously for a full year.

- Tank gases trapped in the sludge and saltcake are in equilibrium with the tank headspace. Therefore, vapor space samples in SST 241-S-109 of TAPs are representative of tank pollutant concentrations.

  Basis: TAPs as identified in TWINS for SST 241-S-109 vapor space are very low. The planned waste retrieval by dissolution of saltcake will release gases and volatile organic species currently trapped in the waste. As retrieval operations agitate the waste, the rates at which chemicals are released from the waste are expected to increase. However, although changes in ventilation rate will affect headspace concentration (higher ventilation rates cause lower headspace concentrations), they are not expected to affect emission rates significantly. Thus, regardless of whether a tank is passively ventilated at 0.28 m^3/min (10 cfm) or actively exhausted at 28 m^3/min (1,000 cfm), the new emission rates of regulated chemicals will be approximately the same.

- The portable exhauster flow rate used during waste retrieval operations from SST 241-S-109 is 28 m^3/min (1,000 cfm).

  Basis: The portable exhauster has a designed flowrate of 28 m^3/min (1,000 cfm). Calculated emissions are based on this flowrate and results are considered conservative because it is unlikely that the exhauster will run continuously for a full year.

- The DBVS OGTS and waste retrieval portable exhauster will operate 24 hours per day for 365 days per year for a total of 8,760 hours.

  Basis: This is very conservative but does represent the maximum run time for emissions calculations.

- The unit concentration factors from industrial source complex dispersion modeling were used for ground level releases for 24-hour average and annual average releases from the 200 West Area.

  24-hour average concentration factor was 3.46 (200 West Area) μg/cm^3/g/sec; annual average was 0.0585 (200 West Area) μg /cm^3/g/sec.

  Basis: These unit concentration factors are used by the tank farm contractor on the Hanford Site for air concentrations at site boundaries. Source: Memorandum to J.S. Hill from P.D. Rittman, "Unit Concentration Factors from ISC3," September 27, 1996 (DSI 1996).

- Organic chemicals in the waste stream received and treated at the DBVS contain the same concentrations as reported in TWINS for SST 241-S-109

  Basis: The waste stream is transferred from SST 241-S-109 or staging tank to the waste receipt tanks. It is reasonable to assume that the organic chemicals in the waste stream are similar.

6.1 CALCULATION RESULTS FOR TAPS

The Appendix B, Table B-1 worksheet presents the comparison of calculated concentrations of TAPs to SQER and ASIL thresholds under active ventilation during DBVS processing. Appendix B, Table B-2 worksheet shows the comparison of calculated concentration of TAPs to SQER and ASIL thresholds under active ventilation during waste retrieval. Columns A through E list the chemical name, CAS number, TAP Class, SQER, and ASIL respectively, and are from WAC 173-460-080, -150, and -160. Column F is the maximum reported value from TWINS (from column H of Appendix A) in mg/m^3 for the specific TAP listed in Column A. Column G is the calculated result for pounds per hour (lbs/hr) discharged. Column H is the result for pounds per year (lbs/yr) discharged (8,760 hrs/yr multiplied by lbs/hr from Column G). Column I is the result of a comparison of Column G lbs/hour discharged or Column H lbs/year discharged to the Column D SQER value noting either the calculated result is at or below the SQER threshold. Column J is the result of a conversion from Column H lbs/yr to μg/m^3. Column K is the result of a comparison between Column J and Column E noting if the calculated value is below the ASIL threshold. Appendix B, Table B-2 presents the comparison of total TAP (ammonia) emissions from retrieval activities to SQER and ASIL thresholds. Calculated emissions of ammonia from SST 241-S-109 waste retrieval activities are below SQER and ASIL thresholds. Appendix B, Table B-3 presents a comparison of total calculated ammonia emissions for both waste retrieval activities and DBVS processing. Total calculated emissions are below SQER and ASIL thresholds.

Organic vapor analyzers, or other similar instruments for detecting fugitive organic emissions will be used to monitor for VOCs as part of the Hanford Industrial Hygiene monitoring program for potential worker exposure, during waste retrieval operations although calculated emissions of TAPs are below SQER and ASIL thresholds. A CEMS will be used for monitoring NOx emissions as noted in Section 5.3.8 from DBVS processing. The best available control technology for toxic (T-BACT) air pollutants for waste retrieval activities from SST 241-S-109 is considered to be a demister, glycol (or similar) heater, pre-filter, and two banks of HEPA filters in series. T-BACT for DBVS processing is considered to be a SCR unit(s) and an up-stream venturi scrubber system.

6.2 CALCULATION RESULTS FOR PM/PM_{10}

Appendix C-1 is the calculation result of particulate matter (PM) and particulate matter under 10 microns (PM_{10}) from off loading and transfer of the soil at the site. Appendix C-2 is the calculation result of particulate emissions from the soil storage pile at the site. Appendix C-3 is the calculation result of particulates from the mixer/dryer. Appendix C-4 is the calculation result of particulates from the waste container fill station. Appendix C-5 is the calculation result of particulates from the melter and post-melt top-off. Appendix C-6 is a summary of the PM/PM_{10} calculated emissions from all sources. Results show PM and PM_{10} emissions for the DBVS are well within regulatory threshold limits of WAC 173-400-110(5)(d).

6.3 CALCULATION RESULTS FOR CRITERIA POLLUTANTS

Appendix D, Table D-1 presents the calculation results for the backup diesel generator run time and NOx emissions in tons/yr. Appendix D, Table D-2 presents the calculation results of NOx emissions from potential use of a 3.4 MM BTU/hr diesel-fired boiler. Appendix D, Table D-3 presents the calculation result of VOC emissions from the diesel tank storage for both the boiler and the 1200 KW (1600-hp) backup generator. Appendix D, Table D-4 presents the calculation result of hydrochloric acid emissions exiting the scrubber. Appendix D, Table D-5 presents the calculation result of NOx emissions from Phase 1 and Phase 2 DBVS activities. Phase 1 results in a total NOx emitted during the cycle of 0.18 tons/month based on one cycle per month. Phase 2 shows total monthly NOx emissions of 0.72 tons/month based on four cycles per month.

6.3.1 Explanation of NOx Emission Calculations

NOx emissions from waste vitrification were calculated using the vendor mass balance and NOx concentration data to calculate uncontrolled and controlled emission rates and scrubbing efficiency. Additional sources of NOx emissions are the backup diesel generator, and the potential use of a diesel-fired boiler. Assuming an 80% total system efficiency, generator NOx emissions were calculated assuming one four-hour test monthly and one 8-hr system usage every three months. For Phases 1 and 2, the corresponding total operating hours are 20 and 80, respectively (Appendix D, Table D-1).

The boiler was assumed to be operated on a continuous basis, but with an equipment availability of 80%, resulting in 7,008 operating hours per year or 584 operating hours per month. A 12-month total NOx emission quantity has been calculated for the initial year of operation, including Phase 1 operations, system changeover, and the start of Phase 2 operations. Boiler emissions from generator testing/operation and boiler operation are included in this calculation (Appendix D, Table D-5).

Finally, the total NOx emissions from the 12-month Phase 2 operating period were calculated. This calculation covers the 12-month period of highest NOx emissions and serves as a "worst-case" 12-month total. Generator and boiler emissions are also included in this calculation, Appendix D, Table D-5). Cumulative 12-month total NOx emissions for Phase 2 operations were calculated to be approximately 13 tons.

6.3.2 Control of NOx Emissions

Criteria pollutants are regulated under WAC 173-400-110. In accordance with WAC 173-400, "General Regulations for Air Pollution Sources," the permit applicant is to install and operate best available control technology (BACT). NOx from post-process operations is controlled by a scrubber system and SCR unit (Figure 7). The SCR technology is the most developed and widely used post-process NOx control technology with ammonia being the most commonly used reagent (EPA 2000). The DBVS use of SCR in addition to an up-stream scrubber system is considered BACT for criteria pollutants.

7.0 REFERENCES

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Ecology, EPA, and DOE, 1989, *Hanford Federal Facility Agreement and Consent Order*, as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

EPA, 2000, *Emission Inventory Improvement Program,* Volume II, *Point Sources,* Chapter 12, "How to Incorporate Effects of Air Pollution Control Device Efficiencies and Malfunctions into Emission Inventory Estimates," EPA-454/R-97-004, U.S. Environmental Protection Agency, Washington, D.C.

EPA AP-42, *Compilation of Air Pollutant Emission Factors*, Volume I: Stationary Point and Area Sources, Ed. 5, U.S. Environmental Protection Agency, Washington, D.C.

HNF-EP-0182, Rev 182, *Waste Tank Summary Report for Month Ending May 31, 2003*, CH2M HILL Hanford Group, Inc., Richland, Washington.

Resource Conservation and Recovery Act of 1976, Public Law 94-580, 90 Stat. 2795, 42 U.S.C. 6901, et seq.

Rittman, P.D., 1996, "Unit Concentration Factors from ISC3," (memo to John S. Hill, September 27) Published in DOE/RL-97-10.

TWINS, Tank Waste Information Network System, available on the Internet at http://twinsweb.pnl.gov., as of August 2003

WAC 173-303, "Dangerous Waste Regulations," *Washington Administrative Code*, as amended.

WAC 173-400, "General Regulations for Air Pollution Sources," *Washington Administrative Code*, as amended.

WAC 173-460, "Controls for New Sources of Toxic Air Pollutants," *Washington Administrative Code*, as amended.

APPENDIX A

MAXIMUM REPORTED POLLUTANT FOR SST 241-S-109

Table A-1. Maximum Reported Toxic Air Pollutants (TAP) for SST 241-S-109

Column A	B	C	D	E	F	G	H	I
Toxic Air Pollutant	Molecular Weight	CAS #	TAP CLASS	SQER (A lbs/yr, B lbs/hr)	ASIL (ug/m3)	Maximum Reported (ppbv)	Maximum Reported (mg/m^3)	SST 241-S-109 ppmv Max Value (a)
							H=G*B/24/1000	
Ammonia	17.0306	7664-41-7	B	2.00	100	4.79E+04	3.4E+01	4.79E+01

Note: (a) Ammonia (reported as 47.9 ppmv) has been converted to ppbv

Conversions:

47.9 ppmv *1000ppbv/ppmv = 47900 ppbv

47900 ppbv*molecular weight/24/1000 = 34 mg/m^3

Source: Tank Waste Inventory Network System (TWINS), http://twinsweb.pnl.gov, August 2004

APPENDIX B

EMISSION CALCULATIONS FOR ACTIVE VENTILATION

- SST 241-S-109 Waste Retrieval
- DBVS Processing

Table B-1. SST 241-S-109 Demonstration Bulk Vitrification Facility - Active Ventilation

VENTILATION RATE	10000	FT^3/MIN
HOURS PER YEAR OPERATON	8,760	
TAP A CONCENTRATION FACTOR (ACF)	0.0585	(200-WEST)
TAP B CONCENTRATION FACTOR (BCF)	3.46	(200-WEST)

Column A	B	C	D	E	F	G	H	I	J	K
Toxic Air Pollutant	CAS #	TAP CLASS	SQER (A LBS/YR) (B LBS/HR)	ASIL (ug/m^3)	Maximum Reported (mg/m^3)	LBS/HR DISCHARGED	LBS/YR DISCHARGED	AT OR BELOW SQER	ESTIMATED OFFSITE CONCENTRATION (ug/m^3)	BELOW ASIL VALUE
Ammonia	7664-41-7	B	2	1.00E+02	3.4E+01	1.27E+00	1.12E+04	YES	5.55E-01	YES

EXAMPLE CALCULATIONS:

TAP B - AMMONIA
G= 10000*3.4E+01*(1/1000)*(1/35.3)*(1/453.6)*60
H= 8,760*1.27E+00
J= 1.27E+00*24*453.6*3.46/86400

Table B-2. SST 241-S-109 Waste Retrieval – Active Ventilation

VENTILATION RATE	1000	**FT^3/MIN**								
HOURS PER YEAR OPERATON	8,760									
TAP A CONCENTRATION FACTOR (ACF)	0.0585	**(200-WEST)**								
TAP B CONCENTRATION FACTOR (BCF)	3.46	**(200-WEST)**								
Column A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**
Toxic Air Pollutant	**CAS #**	**TAP CLASS**	**SQER (A LBS/YR, B LBS/HR)**	**ASIL (ug/m^3)**	**Maximum Reported (mg/m^3)**	**LBS/HR DISCHARGED**	**LBS/YR DISCHARGED**	**AT OR BELOW SQER**	**ESTIMATED OFFSITE CONCENTRATION (ug/m^3)**	**BELOW ASIL VALUE**
Ammonia	7664-41-7	B	2	1.00E+02	3.4E+01	1.27E-01	1.12E+03	YES	5.55E-02	YES

EXAMPLE CALCULATIONS:

TAP B - AMMONIA G= 1000*3.4E+01*(1/1000)*(1/35.3)*(1/453.6)*60
H= 8,760*1.27E+00
J= 1.27E+00*24*453.6*3.46/86400

Table B-3. Total Active Ventilation Emissions

Toxic Air Pollutant	Ammonia
CAS #	7664-41-7
TAP CLASS	B

ACTIVITY	SQER TAP CLASS B (LBS/HR)	ASIL (ug/m^3)	LBS/HR DISCHARGED	AT OR BELOW SQER	ESTIMATED OFFSITE CONCENTRATION (ug/m^3)	BELOW ASIL VALUE
Waste Retrieval			1.27E-01		5.50E-02	
DBVS Processing			1.27E+00		5.55E-01	
TOTAL	2	1.00E+02	1.40E+00	YES	6.10E-01	YES

APPENDIX C

EMISSION CALCULATIONS FOR PARTICULATE MATTER

Table C-1. Emission Calculations for PM/PM_{10} — Off-Loading Soil

Emission Factors from AP-42 11.19.1, Table 11.19.1-1

Source	Factor PM (lb/ton)	
Soil handling, transfer, and storage with wet scrubber (controlled)[1]	0.0013	
Assumed control efficiency for wet scrubber for PM	95%	
Soil handling, transfer, and storage (uncontrolled)	0.026 Emission factor / (100% - scrubber efficiency)	
Assumed PM & PM_{10} control efficiency for baghouse	99%	
	Clean Soil (Stream 4)	Topoff Soil (Stream 11)
Soil flow rate to each impingement tank	188 kg/hr 413.6 lb/hr	110 kg/hr 242 lb/hr

P&ID #	Process	Unit ID	Mass flow rate (lb/hr)	Emission Rate - uncontrolled (lb/hr) PM	PM_{10}[3]	Calculation
F-143643-00-A-0021, Rev A, 3/10/04	Clean Soil Impingement Tank	31-D74-005	413.6	5.38E-03	5.38E-03	Emission factor X mass flow rate/2000
	Top-Off Soil Impingement Tank[2]	31-D74-007 /008/009	242	3.15E-03	3.15E-03	Emission factor X mass flow rate/2000
				Emission Rate Controlled (lb/hr)[4]		
F-143643-00-A-0021, Rev A, 3/10/04	Baghouse	31-N31-023	8.523E-03	8.52E-05	8.52E-05	Mass flow rate X (100% - baghouse efficiency)

Notes
1. Choke feed into hopper
2. One of three (3) impingement tanks in use at once
3. Assume all PM is PM_{10}
4. Baghouse emissions to Stack 31-D26-004

Table C-2. Emission Calculations for PM/PM_{10} — Soil Storage Pile

AP-42 Emission Factors from AP-42 Chapter 13.2.4		
k	0.35	Dimensionless particle size multiplier for <10 um diameter
U	12.4	Mean wind speed, meters/sec
M	3	Material moisture content, wt percent
Emission Factor	2.07E-03	lb/ton
Calculation	$k \times 0.0032 \times ((U/5)^{1.3} / (M/2)^{1.4})$	

Emission Point Description	Stockpile Weight[1]	Annual Operation	Maximum Daily PM_{10} Emission Rate	Annual Avg. PM_{10} Emission Rate	Calculation
	(tons)	(hrs/yr)	(lb/hr)	(ton/year)	Maximum Daily PM_{10} Emission Rate = Stockpile Weight X Emission Factor Annual Ave. PM_{10} Emission Rate = lb/hr X Annual operation / 2000
Soil Storage Pile	35	8760	0.07	0.32	

Notes:

1. Approximate weight needed for vitrification of one (1) containerload of waste. Assume one containerload dumped into the storage pile per hour.

Table C-3. Emission Calculations for PM/PM_{10} — Mixer/Dryer

Emission Factors from AP-42 11.7, Table 11.7-1

Source				Factor PM (lb/ton)		
Dryer				2.3		
Mass flow rate of materials to dryer			Waste/Simulant (Stream 1)	Clean Soil (Stream 4)		Dust Recycle (Stream 18)
			319.7 kg/hr	188 kg/hr		2 kg/hr
			703.3 lb/hr	413.6 lb/hr		4.4 lb/hr
				Emission Rate - uncontrolled (lb/hr)[1]		
P&ID #	Process	Unit ID	Mass flow rate (lb/hr)	PM	PM_{10}[2]	Calculation
F-143643-00-A-0021, Rev A, 3/10/04	Dryer	33-D25-006	1121.3	1.29	1.29	Emission factor X mass flow rate/2000

Notes
1. Dryer emissions to main offgas treatment system
2. Assume all PM is PM_{10}

Table C-4. Emission Calculations for PM/PM_{10} — Waste Container Fill Station

Emission Factors from AP-42 11.19.1, Table 11.19.1-1

Source	Factor PM (lb/ton)	
Sand handling, transfer, and storage with wet scrubber (controlled)	0.0013	
Assumed control efficiency for wet scrubber for PM	95%	
Sand handling, transfer, and storage (uncontrolled)	0.026	Emission factor (100% - scrubber efficiency)
For emissions from ICV Melt Station Emission factor from AP-42 11.15, Table 11.15-1, Melting Furnace Container, Uncontrolled	1.4	lb/ton

Mass flow rate of materials to ICV unit	Dried Waste/Soil (Stream 5)	Topoff Soil (Stream 11)
	284 kg/hr	110 kg/hr
	624.8 lb/hr	242.0 lb/hr

P&ID #	Process	Unit ID	Mass flow rate (lb/hr)	Emission Rate - uncontrolled (lb/hr)[1]		Calculation
				PM	PM_{10}[2]	
F-143643-00-A-0021, Rev A, 3/10/04	ICV Melt Station	N/A	624.8	0.437	0.437	Emission factor X mass flow rate/2000
	Container Top-off Station	N/A	242.0	0.003	0.003	Emission factor X mass flow rate/2000
	TOTAL[2]			0.441	0.441	

Notes
1. All emissions to offgas treatment system through sintered metal filter
2. Assume all PM is PM_{10}

Table C-5. Emission Calculations for PM/PM_{10} — Melter

Treatment System Component Efficiencies[1]		Stream Filtered[2] ICV (all)	Dryer
Sintered metal filter No. 1 PM/PM_{10} removal efficiency	99.50%	X	
Sintered metal filter No. 2 PM/PM_{10} removal efficiency	99.50%	X	
Quench PM/PM_{10} removal efficiency	10.00%	X	
Scrubber PM/PM_{10} removal efficiency	95.00%	X	
Mist eliminator No.1/No. 2 PM/PM_{10} removal efficiency	0.00%	X	
Mist eliminator No. 3 PM/PM_{10} removal efficiency	0.00%	X	
HEPA Filter PM/PM_{10} removal efficiency	99.95%	X	X
Carbon Filter PM/PM_{10} removal efficiency	0.00%	X	X
Packed Tower PM/PM_{10} removal efficiency	Not used		
SCR PM/PM_{10} removal efficiency	0.00%	X	X
Polishing Filter PM/PM_{10} removal efficiency	99.95%	X	X

Process	Emission Rate - uncontrolled (lb/hr)		Emission Rate - controlled (lb/hr)[3]		Calculation
	PM	PM_{10}[4]	PM	PM_{10}[4]	
ICV (all)	0.44	0.44	1.24E-13	1.24E-13	mass flow rate X [(1-control efficiency) for all components in use)]
Dryer	1.29	1.29	3.22E-07	3.22E-07	mass flow rate X [(1-control efficiency) for all components in use)]
TOTAL	1.73	1.73	3.22E-07	3.22E-07	

Notes:
1. From Table 4-2, RD&D permit application
2. From P&IDs F-143643-00-A-0022, -0026, Rev A, 3/10/04
3. System emissions to Stack 36-N31-024
4. All PM emissions are assumed to be PM_{10}

Table C-6. Emission Calculations for PM/PM_{10} — Summary

Exhaust points	Total PM (lb/hr)	Total PM_{10} (lb/hr)
Stack 36-N31-024 - Bulk Vitrification Process (App C-5)	3.22E-07	3.22E-07
Stack 31-D26-004 - Soil Handling (App C-1)	8.52E-05	8.52E-05
Fugitive - Soil Storage Pile (App C-2) (Optional)	7.24E-02	7.24E-02
TOTAL	7.25E-02	7.25E-02

APPENDIX D

EMISSION CALCULATIONS FOR CRITERIA POLLUTANTS

Table D-1. Emission Calculations — Criteria Pollutants
Diesel Generator Run-Time

Pollutant	lb/hp-hr	lb/MMBTU
NOx	3.10E-02	4.41
CO	6.68E-03	0.95
SOx	2.05E-03	0.29
PM/PM_{10}	2.20E-03	0.31
VOC	2.47E-03	0.35

Generator Size	1,200 KW
Efficiency	75%
Engine Size	1,600 HP

Operating Hours	Phase 1	Phase 2
hrs/month testing	4	4
months of operation	3	12
hrs/startup	8	8
# of startups	1	4
Total hours	20	80

	Phase 1			Phase 2		
	Monthly Test	Start-up	TOTAL (tons/yr)	Monthly Test	Start	TOTAL (tons/yr)
	4 hrs	8 hrs		4 hrs	8 hrs	
NOx (tons)	0.099	0.198	0.496	0.099	0.198	1.984
CO (tons)	0.021	0.043	0.107	0.021	0.043	0.428
SOx (tons)	0.007	0.013	0.033	0.007	0.013	0.131
PM/PM_{10} (tons)	0.007	0.014	0.035	0.007	0.014	0.141
VOC (tons)	0.008	0.016	0.040	0.008	0.016	0.158

Note: Emission Factors are from AP-42 Table 3.3-1)

Table D-2. Emission Calculation – Criteria Pollutants
Boiler Process Emissions

Emission factors (AP-42 Tables 1.3-1 and 1.3-3)

Pollutant		lb/1000 gal	
NOx		20.00	
CO		5.00	
Total SOx		0.72	Sulfur content = 0.5%
PM/PM_{10}		2.00	
VOC		0.34	
Methane		0.22	

Boiler duty rating	1	MW	
	3,413,000	BTU/hr	
Fuel oil heating value	135,000	BTU/gal	
System efficiency	90%		
Fuel consumption	28.1	gal/hr	Boiler duty rating / Fuel oil heating value / System efficiency
Operating schedule	7,008	hrs/yr	
	584	hrs/month	

Emissions

Pollutant	lb/hr	Calculation	tons/month	tons/yr
NOx	0.562	Emission factor X volumetric flow rate/1000	0.16	1.97
CO	0.140	Emission factor X volumetric flow rate/1000	0.04	0.49
SOx	0.020	Emission factor X volumetric flow rate/1000	0.01	0.07
PM/PM_{10}	0.056	Emission factor X volumetric flow rate/1000	0.02	0.20
VOC	0.010	Emission factor X volumetric flow rate/1000	0.003	0.03
Methane	0.006	Emission factor X volumetric flow rate/1000	0.002	0.02

Table D-3. Emission Calculations — Volatile Organic Compounds

Utilizing method of calculation of emissions as stated in AP-42 Document 7.0 *Liquid Storage Tanks*.

Generator Fuel Storage Tank

Diameter	5 ft
Length Tnk	15 ft
De	9.774528 ft
Height VS	2.5 ft
MW	130 lb/lbmol
Max Temp	518.57 Deg. R
Min Temp	503.57 Deg. R
Taa	511.07 Deg. R
Alpha	0.17 Paint Factor
Tb	511.09 Deg. R
I	1053 BTU/ft^2/day
Pva	0.0105 psi
R	10.731 psi ft^3/lbmol Deg R.
DTa	15 Dg. F & R
B	8223.25 Deg. R
Annual TP	10,000 Gal/Yr
# Turnover	1 Turnover/Yr

		Standing Storage Loss		Working Loss	
TLA	512.4954 Deg. R	Ls	0.526624 lb/yr	Lw	0.325 lb/yr
DTv	15.81228 Deg. R	Vv	187.5949	Q	238.0952 bbl/yr
DPv	0.002599 psi	Wv	0.000248	Kn	30.16667 If Turnovers > 36
DPb	0 psi	Ke	0.03103	Kn	1 If Turnovers < or = 36
Pa	14.7 psi	Ks	0.998611	Kp	1

Total Loss	**0.851624 lb/yr VOC**
	0.000426 tons/yr VOC

Boiler Fuel Storage Tank

Assume one month's fuel consumption in storage	
Hourly fuel consumption	28.1 gal/hr
Operating hours/month	584 hrs
Fuel storage requirement	16,405 gal
Tank Size	20,000 gal

Diameter	10 ft
Height	35 ft
De	35 ft
Height VS	17.5 ft
MW	130 lb/lbmol
Max Temp	518.57 Deg. R
Min Temp	503.57 Deg. R
Taa	511.07 Deg. R
Alpha	0.17 Paint Factor
Tb	511.09 Deg. R
I	1053 BTU/ft^2/day
Pva	0.0105 psi
R	10.731 psi ft^3/lbmol Deg R.
DTa	15 Dg. F & R
B	8223.25 Deg. R
Annual TP	240,000 Gal/Yr
# Turnover	12 Turnover/Yr

		Standing Storage Loss		Working Loss	
TLA	512.4954 Deg. R	Ls	46.87464 lb/yr	Lw	7.8 lb/yr
DTv	15.81228 Deg. R	Vv	16836.96	Q	5714.286 bbl/yr
DPv	0.002599 psi	Wv	0.000248	Kn	2.666667 If Turnovers > 36
DPb	0 psi	Ke	0.03103	Kn	1 If Turnovers < or = 36
Pa	14.7 psi	Ks	0.990355	Kp	1

Total Loss	**54.67464 lb/yr VOC**
	0.027337 tons/yr VOC

Table D-4. Emission Calculations — Hydrochloric Acid Exiting Scrubber

Scrubber Inlet Stream Characterization (Stream 19,P&ID F-143643-00-A-0022, Rev A, dated 3/10/04)

PPM of HCl to scrubber	5.13 ppm
Flowrate of stream to scrubber	5,258 kg/hr
Water/water vapor flowrate of stream to scrubber	6 kg/hr
Dry flowrate of stream to scrubber	5,252 kg/hr
	152,023 scfh
Density of HCl	0.1024 lb/cu ft
Mass flow rate of HCl to scrubber	4.79 lb/hr

Scrubber Outlet Stream Characterization (Stream 29,P&ID F-143643-00-A-0022, Rev A, dated 3/10/04)

PPM of HCl exiting scrubber	0.15 ppm
Flowrate of stream exiting scrubber	5,356 kg/hr
Water/water vapor flowrate of stream to scrubber	145 kg/hr
Dry flowrate of stream to scrubber	5,211 kg/hr
	150,856 scfh
Density of HCl	0.1024 lb/cu ft
Mass flow rate of HCl exiting scrubber	0.14 lb/hr
Scrubber HCl efficiency	97.10%

Table D-5. Emission Calculations — NOx (Page 1 of 2)

Scrubber Inlet Stream Characterization (Stream 19, P&ID F-143643-00-A-0022, Rev A, dated 3/10/04)

PPM of NOx to scrubber	6,406 ppm	
Total flowrate of stream to scrubber	5,258 kg/hr	
Water/water vapor flowrate of stream to scrubber	6 kg/hr	
Dry flowrate of stream to scrubber	5,252 kg/hr	
	152,023 scfh	Dry flowrate X 2.2/0.076 (density of air @ STP)
NO_2 conversion factor (ppm to ug/m^3)	1,880	
Mass flow rate of NOx to scrubber	114.21 lb/hr	
Mass flow rate = ppm NOx X conversion factor X volumetric flow rate X unit conversions		
Units = ppm X (ug/m^3)/ppm X ft^3/hr X m^3/ft^3 X lb/ug		
= lb/hr		

Scrubber Outlet Stream Characterization (Stream 29, P&ID F-143643-00-A-0022, Rev A, dated 3/10/04)

PPM of NOx at scrubber outlet	4,451 ppm	
Flowrate of stream at scrubber outlet	5,356 kg/hr	
Water/water vapor flowrate of stream at scrubber outlet	145 kg/hr	
Dry flowrate of stream at scrubber outlet	5,211 kg/hr	
	150,856 scfh	Dry flowrate X 2.2/0.076 (density of air @ STP)
NO_2 conversion factor (ppm to ug/m^3)	1,880	
Mass flow rate of NOx at scrubber outlet	78.75 lb/hr	
Scrubber NOx efficiency	31.1%	

SCR Inlet Stream Characterization (Stream 40, P&ID F-143643-00-A-0026, Rev A, dated 3/10/04)[1]

PPM of NOx to SCR	3,068 ppm	
Dry flowrate of stream to SCR[1]	16,863 lb/hr	
	221,880 scfh	Mass flowrate/0.076 (density of air @ STP)
NO_2 conversion factor (ppm to ug/m^3)	1,880	
Mass flow rate of NOx to SCR	79.83 lb/hr	

Stack Exhaust Stream Characterization (Stream 46, P&ID F-143643-00-A-0026, Rev A, dated 3/10/04)[1]

PPM of NOx exiting stack	82 ppm	
Dry flowrate of stream exiting stack[2]	16,853 lb/hr	
	221,750 scfh	
NO_2 conversion factor (ppm to ug/m^3)	1,880	
Mass flow rate of NOx to stack	2.13 lb/hr	
SCRr NOx efficiency	97.3%	
Total NOx removal efficiency	98.1%	

Phase 1 NOx Emissions

Melt cycle duration	168 hrs	
Total NOx emitted during cycle	358 lb	
	0.18 tons	
Cycles/Month	1	
Total number of cycles including simulant testing	3	
Total NOx emitted monthly	0.18 **tons/month**	

Phase 2 NOx Emissions

Total NOx emitted during cycle	358 lb	
	0.18 tons	
Cycles/Month	4	
Total NOx emitted	0.72 **tons/month**	

Phase 1 and Phase 2 Treatment — 12-Month Total

Table D-5. Emission Calculations — NOx (Page 2 of 2)

1st 12-Month Total (Including Backup Generator and Boiler)

Date	NOx emissions (tons)	NOx emissions (cumulative tons)	
Oct-04	0.44	0.44	(including generator test)
Nov-04	0.44	0.88	(including generator test)
Dec-04	0.64	1.53	(including generator test and start)
Jan-05	system changeover for Phase 2 operations		
Feb-05			
Mar-05			
Apr-05	0.98	2.51	(including generator test)
May-05	0.98	3.49	(including generator test)
Jun-05	1.18	4.66	(including generator test and start)
Jul-05	0.98	5.64	(including generator test)
Aug-05	0.98	6.62	(including generator test)
Sep-05	1.18	7.80	(including generator test and start)

12-Month Total for Phase 2 Operations (Including Backup Generator and Boiler)

Date	NOx emissions (tons)	NOx emissions (cumulative tons)	
Apr-05	0.98	0.98	(including generator test)
May-05	0.98	1.96	(including generator test)
Jun-05	1.18	3.14	(including generator test and start)
Jul-05	0.98	4.12	(including generator test)
Aug-05	0.98	5.10	(including generator test)
Sep-05	1.18	6.28	(including generator test and start)
Oct-05	0.98	7.26	(including generator test)
Nov-05	0.98	8.23	(including generator test)
Dec-05	1.18	9.41	(including generator test and start)
Jan-06	0.98	10.39	(including generator test)
Feb-06	0.98	11.37	(including generator test)
Mar-06	1.18	12.55	(including generator test and start)

1. Derivation of SCR inlet stream flowrate:

From PI&D F-143643-00-A-0022, Stream 38, $M_{carbon\ filter\ disch}$ =	5,603 kg/hr
Water/water vapor flowrate of stream	145 kg/hr
Dry flowrate of stream	5,458 kg/hr
	12,008 lb/hr
From PI&D F-143643-00-A-0026, Stream 38, $M_{carbon\ filter\ disch}$ =	1,126,123 kg total for cycle
Water/water vapor flowrate of stream	29,054 kg total for cycle
Dry flowrate of stream	1,097,069 kg total for cycle
	2,413,552 lb total for cycle
Operating hours : 201	
Assume same schedule for Stream 40	
From PI&D F-143643-00-A-0026, Stream 40, $M_{carbon\ filter\ disch}$ =	1,569,712 kg total for cycle
Water/water vapor flowrate of stream	29,040 kg total for cycle
Dry flowrate of stream	1,540,672 kg total for cycle
	3,389,478 lb total for cycle
	16,863 lb/hr

2. Derivation of SCR stack exhaust flowrate

From PI&D F-143643-00-A-0026, Stream 46, $M_{exhaust\ stack\ disch}$ =	1,571,830 kg total for cycle
Water/water vapor flowrate of stream	32,066 kg total for cycle
Dry flowrate of stream	1,539,764 kg total for cycle
	3,387,481 lb total for cycle
	16,853 lb/hr

Phase 1 and Phase 2 Treatment — 12-Month Total

Attachment 2
04-ED-076

Permit Writers Checklist for Completeness

Permit Writers Checklist for Completeness
Washington State Department of Ecology
Notice of Construction Application Approval Order

In the matter of approving a nonradioactive air emissions notice of construction application for:

Applicant	Requesting Party	*U.S. Department of Energy, Office of River Protection/CH2M HILL, Hanford Group, Inc.*
	Responsible Program Manager	*Billie M. Mauss*
	Point of Contact	*Dennis W. Bowser*

Project Title/Document Number	*Notice of Construction For The Bulk Vitrification Test And Demonstration Facility and Partial Retrieval of Tank 241-S-109, Rev. 1 [Non Rad NOC for Bulk Vitrification, Rev 1, August 2004]*	
Applicant Transmittal		
Facility Identification	*Bulk Vitrification Test And Demonstration Facility*	
Facility Location	*200 West Area: 241-S Tank Farm; SST 241-S-109*	
Project Summary	*The Bulk Vitrification Test and Demonstration program will evaluate the performance of a bulk vitrification treatment process for low-activity tank waste to support the Hanford Waste Treatment Plant. Approximately 300,000 gallons of low-activity tank waste will be retrieved and processed in two operational phases. Waste will be vitrified in containers using resistive heating to melt the waste. Vitrified waste will meet the waste acceptance criteria for disposed at a Hanford onsite RCRA permitted facility.*	
Ecology Received Date		
Completeness Review		
Approval Order Number	Draft Date	
	Issue Date	

Shaded areas to be completed by Ecology

Regulatory Applicability

Regulation	Applicability		Complete (Y/N)
SEPA Checklist	Attached ☐	NA X *The proposed action is categorically exempt from SEPA Rules, WAC 197-11.* *However, for informational purposes, a Resource Conservation and Recovery Act of 1976 (RCRA) Research, Development, and Demonstration (RD&D) Permit application for this proposed activity was submitted to Ecology (May 2004) and included a SEPA Checklist. Draft permit conditions have been issued by Ecology for public review and comment.*	
NEPA	*Categorical Exclusion For Treatability and Demonstration Testing Of Supplemental Technologies, Hanford Site, Richland, Washington, December 17, 2003.*		
WAC 173-400-091 (Voluntary Emission Limit)			

WAC 173-400 (Criteria Pollutants)	Yes X				No ☐	
Pollutant (List pollutants emitted)	Release (pounds)	Exemption Threshold (pounds (Section 110)	PSD Threshold (tons/year) (Section 141) (Section 113)	PSD (Y/N)	Not applicable	
Criteria Pollutants						
NO_x	*20,000*	*4000*	*40.0*	*N*		
PM	*<2500*	*2500*	*25.0*	*N*		
PM_{10}	*<1,500*	*1500*	*15.0*	*N*		
	Calculated Release	SQER Threshold (lbs/hour)	ASIL Threshold (ug/m^3)	Below SQER and ASIL		
Toxic Air Pollutant						
SQER (lbs/hour) NH_3 (Ammonia)	*1.4*	*2*		*Yes*		
ASIL (ug/m^3) NH_3 (Ammonia)	*0.61*		*100*	*Yes*		

WAC 173-460 (TAPs)	*Refer to Section 6.0* *Refer to Appendices B,C, and D*				
WAC 173-400-171 (Public Involvement)					
WAC 173-400-116 (Fees, based on complexity)	Low	Moderate	High	Other	
	☐	☐	☐	☐	
WAC 173-401 (AOP Revision Category)	Off-permit (Section 724)	Minor (Section 725)	Significant (Section 725)		
	X	☐	☐		
Other (WAC 173-XXX)					

NOCA Required Components

Component	Location in Application	Complete (Y/N)
Project Description	Refer to Section 6.0	
Emissions		
Estimated Criteria pollutant emissions, PM and PM_{10} in the form of particulates, are provided in Appendix C of the NOC application. PM and PM_{10} emissions would result from: off loading the soil additive at the site; soil storage pile; mixer/dryer operations; waste container fill station; and melter. PM and PM_{10} do not exceed threshold levels as regulated in WAC 173-400-110(5)(d).. NOx is the primary pollutant of concern resulting from projected diesel generator and diesel-fired boiler run times. Calculated NOx emissions estimated at 13 tons per year (Appendix D, Table D-5) exceed the exemption threshold of 2 tons per year. Criteria pollutant emissions do not meet the definition of significant, and therefore do not trigger PSD review. *Ammonia is the Class B TAP identified in the NOC application and is based on vapor space sample data from Hanford Single-Shell Tank 241-S-109 located in the 200 West Area of the Hanford Site. Vapor space data was obtained from Hanford's Tank Waste Information System Network. Appendix A provides the maximum reported TAP vapor sample data for Tank 241-S-109. Appendix B provides calculations of estimated ammonia emissions from Tank 241-S-109 retrieval activities and the bulk vitrification processing under active ventilation. The calculated emissions of ammonia released to the environment are below the SQER value of 2 lbs/hour and calculated emissions of ammonia do not exceed the ASIL value of 100 ug/m^3 (WAC 173-460).*		
Emissions Estimate and Air Impact Analysis	*Refer to Appendices B,C, and D*	
Criteria/TAPs	*Refer to Section 6.1, Appendices B and C*	
Dispersion Modeling Methodology	*Refer to Section 6.0, Appendix B*	
Air Quality Modeling Results	*Refer to Appendix B*	
Controls		
The Best Available Control Technology for Toxics (T-BACT) will use the abatement controls (i.e., HEPA filtration) required for radioactive air emissions. For particulates and aerosols, two stages of HEPA filters with an average 99.95% removal efficiency are proposed as T-BACT. HEPA filters are also the		

selected T-BACT selected for particulates and aerosols at the Waste Treatment Plant (24590-WTP-RPT-ENV-01-005, Rev 0). HEPA filters are the required Best Available Radionuclide Control Technology for the Waste Treatment Plant by the State of Washington, Department of Health (24590-WTP-RPT-ENV-01-004,Rev 1). Emission controls approved by the State of Washington, Department of Health are deemed sufficient for possible concerns over deminimus criteria and/or particulate emissions.

The HEPA filters will be nuclear-grade with a rated 99.97% removal efficiency and an in-place leak test, test efficiency of 99.95%. The HEPA filters are protected by airflow passing through a heater to raise the temperature and dew point prior to reaching the filters.

As a best management practice, organic vapor analyzers or similar instruments, will be used for confirming low fugitive organic emissions as part of Hanford's industrial hygiene program. No special volatile organic compound (VOC) controls are required.

Control Equipment Description/Efficiencies	*Refer to Section 5.2.1 and 5.5.8*	
BACT or T-BACT	*Refer to Section 6.1*	
Proposed Criteria/TAPs Controls	*Refer to Section 5.2.1 and 5.5.8*	
Monitoring		
Ammonia emissions are calculated to be below the respective SQER and ASIL threshold levels, therefore, no stack TAP air emission sampling or monitoring is required. Organic vapor analyzers, or other similar instruments for detecting fugitive organic emissions as part of Hanford's Industrial Hygiene program to monitor worker exposure, is used to confirm low VOCs emissions during retrieval operations. VOC's are monitored once before exhauster operation, once during exhauster operation, and once after exhauster operation is complete. The Bulk Vitrification stack is equipped with a continuous monitoring system for monitoring criteria pollutants. Monitoring results are reported annually and monitoring records are available upon request.		
Airborne Emissions Monitoring Systems	*Refer to Section 5.2.2 and 5.3.8*	
Air Operating Permit Requirements	*A Notification of Off-Permit Change was submitted with NOC application*	
Schedule		
Field activities to support site preparation and equipment installation are currently scheduled to begin no earlier than September 10, 2004. Phase I activities are currently scheduled to start in April, 2005 (retrieve waste from S-109) and be completed no later than December, 2005 (cool melt). The activity start and complete dates may vary dependent on Hanford Site planning. Phase II activities will follow..		

Proposed NOCA Approval Order Conditions and Restrictions

Component	Location in Application	Reviewed (Y/N)
Summary of Proposed Approval Order Conditions	*Submitted separately*	

Attachment 3
04-ED-076

Hanford Site Air Operating Permit
Notification of Off-Permit Change 00-05-006

HANFORD SITE AIR OPERATING PERMIT
Notification of Off-Permit Change
Permit Number: 00-05-006

This notification is provided to Washington State Department of Ecology, Washington State Department of Health, and the U.S. Environmental Protection Agency as notice of an off-permit change described as follows.

This change is allowed pursuant to WAC 173-401-724(1) as:
1. Change is not specifically addressed or prohibited by the permit terms and conditions
2. Change does not weaken the enforceability of the existing permit conditions
3. Change is not a Title I modification or a change subject to the acid rain requirements under Title IV of the FCAA
4. Change meets all applicable requirements and does not violate an existing permit term or condition
5. Change has complied with applicable preconstruction review requirements established pursuant to RCW 70.94.152.

Provide the following information pursuant to WAC-173-401-724(3):

Description of the change:	
Submittal of, APPROVAL OF NOTICE OF CONSTRUCTION FOR THE BULK VITRIFICATION TEST AND DEMONSTRATION FACILITY AND PARTIAL RETRIEVAL OF TANK 241-S-109. *This Notice of Construction application requests approval for construction and operation of a Bulk Vitrification Test and Demonstration Facility located in the 200 West Area of the Hanford Site. The bulk vitrification testing progra includes the retrieval of mixed waste from single-shell tank 241-S-109 and the operation of a melter to vitrify waste in waste containers suitable for onsite burial.* *A Notice of Construction application has been submitted as the bulk vitrification process, the use of a backup diesel generator, and the use of a diesel-fired boiler has the potential to emit NOx exceeding the threshold exemption quantity of two tons per year. During retrieval operations, the ventilation system exhauster will operate at approximately 1,000 cubic feet per minute. During vitrification activities the ventilation system exhauster will operate at approximately 10,000 cubic feet per minute.*	
Date of Change: To be provided in the regulatory agency	
The date the approval order is issued by the Washington State Department of Ecology.	
Describe the emissions resulting from the change:	
Emissions of all Toxic Air Pollutants as defined in WAC 173-400 and 460 are calculated to be below their respective SQER and ASIL values. Criteria pollutant NOx exceeds the threshold limits of WAC 173-400-110. Expected NOx emissions will be approximately 13 tons per year.	
Describe the new applicable requirements that will apply as a result of the change: To be provided in the agency approval order.	
Conditions and limitations will be those identified in the approved order when issued by the Washington State Department of Ecology	
For Hanford Use Only:	
AOP Change Control Number:	Date Submitted: